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AGRICULTURAL AND MECHANICAL COLLEGE OF TEXAS
W. B. BIZZELL, President

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DIVISION OF ANIMAL INDUSTRY

GRAIN SORGHUMS VS. CORN FOR FATTENING LAMBS

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*In cooperation with the School of Veterinary Medicine, A. & M. College of Texas.
**In cooperation with the United States Department of Agriculture.

BULLETIN No. 269 OCTOBER, 1920

GRAIN SORGHUMS VS. CORN FOR FATTENING LAMBS

J. M. JONES,
ROY A. BREWER,
R. E. DICKSON.

Lamb-feeding in Texas has never been engaged in extensively,—probably on account of the fact that stockmen interested in this particular industry have not as yet come to appreciate fully the value of the grain sorghums in the lamb-fattening ration.

The grain sorghums are numbered among West Texas' safest crops. There is some hesitancy, however, on the part of the farmers residing in those sections of Texas adapted to their production, to engage extensively in the propagation of these crops owing to the limited market demand for them. According to the 1919 December estimate of the United States Department of Agriculture Crop Report, the production of grain sorghum in Texas, for the year 1919, was 59,333,000 bushels. According to digestion experiments conducted by Fraps at the Texas Station* it has been shown that threshed milo grain has a productive value of 19.1 as compared with 20.63 for corn, or a feeding value of approximately 93 per cent. of that of corn.

According to reliable information, twenty different shipments of corn chops, inspected by the Texas Feed Control Service, since September 1, 1919, were sold in Texas at an average wholesale price of $63.09 per ton, while a like amount of milo chops sold at an average wholesale price of $50.66 per ton, a figure twenty per cent. lower than corn, which according to investigations previously conducted by the Texas Station, represented a loss to the producers of approximately thirteen per cent. of its actual market value.

Any crop that sells at thirteen per cent. below its actual worth or market value is almost certain to meet with curtailed production. The market for the grain sorghums has not as yet been standardized, a lack probably due to the fact that feeders operating outside the grain sorghum producing areas have not come to realize that these grains have productive values almost equal to that of corn.

Extensive feeding investigations in which the grain sorghums have been compared with corn for fattening lambs have not as yet been reported. Livestock feeding tests have been reported by the Kansas, Oklahoma, and Texas Experiment Stations; but although interesting and valuable results have been obtained, it would seem that further research with these feeds in the lamb-fattening ration is warranted.

In several feeding tests in which cross-bred lambs were being compared at the Texas Experiment Substation No. 7, those fattened on ground milo heads, cottonseed meal, and alfalfa hay, made gains aver-

*Texas Station Bulletins Nos. 170 and 203.

aging between 0.4 and 0.5 pound daily throughout ninety to one hundred-day feeding periods. Such gains are regarded as phenomenal, since lambs fattened on standard corn-belt rations very seldom make daily gains equaling or surpassing those figures.

Five years ago the Texas Experiment Station, Substation No. 7, discovered that ground milo heads have a valuable place in the ration of the fattening lamb. Cross-bred lambs were being fattened on ground milo, cottonseed meal, and hay. Toward the end of the experiment the supply of the threshed grain became exhausted and as a threshing machine was not immediately available to thresh out the necessary amount of grain with which to complete the feeding test, it was decided to grind the entire milo heads. This was done, and much to the surprise of the authors, the daily gains made by the lambs after the substitution of the ground heads for the threshed grain was almost as satisfactory as those made previously to the substitution.

It was with the view of throwing additional light upon this subject that a more elaborate experiment in the feeding of grain sorghums to fattening lambs was planned and initiated in November, 1919.

OBJECT.

The object of this test was to compare the gains and the economy of gains made by lambs fattened on milo, on feterita, on kafir, and on corn.

RATIONS FED.

The following rations were supplied:

Lot I. Ground milo heads, cottonseed meal, and alfalfa hay.
Lot II. Ground threshed feterita, cottonseed meal, and alfalfa hay.
Lot III. Ground corn, cottonseed meal, and alfalfa hay.
Lot IV. Ground threshed milo, cottonseed meal, and alfalfa hay.
Lot V. Ground feterita heads, cottonseed meal, and alfalfa hay.
Lot VI. Ground threshed kafir, cottonseed meal, and alfalfa hay.

DURATION OF EXPERIMENT.

The feeding test herein reported extended over a period of ninety days, beginning November 26, 1919, and closing February 24, 1920.

THE LAMBS.

The one hundred and twenty lambs used in this test were of Rambouillet breeding, and with the exception of twenty head, which were bred by the Experiment Station at Substation No. 7 (the Station at which this test was conducted), were purchased from a neighboring ranchman in Dickens County. The lambs were of uniform type and breeding, and aside from being rather thin, no criticism could be made. These lambs were purchased early in November, 1919, at $8.00 per head, and the average weight was 59.42 pounds. Figured on a pound basis, the purchase price of these lambs averaged about 13.5 cents, which was

the price being paid for feeders on the Kansas City market at that season. The lambs were divided equally, so far as such a division was possible with respect to uniformity of type and weight. The six lots were numbered consecutively from left to right. In order to assure fairness and impartiality in the assignment of rations, slips designating the six different rations were prepared and drawn from a hat by a disinterested party. The respective rations were assigned to each lot in consecutive order as designated by the slips as they were drawn from the hat.

Representative samples of the respective feeds utilized during the test were taken at thirty-day intervals throughout the experiment. All samples were selected in accordance with instructions issued by the Station Chemist and submitted to him for analyses, the respective results being set forth in Table 1 below.

Table I.—Composition of feeds used during experiment.

Kinds of Feed.	Protein per cent.	Fat per cent.	Crude fibre per cent.	Nitrogen-free extract per cent.	Water per cent.	Ash per cent.
Milo heads, ground	10.53	2.91	7.12	64.97	11.15	3.32
Feterita heads, ground	9.95	2.87	6.37	65.44	12.63	2.74
Threshed feterita, ground	12.58	3.74	2.28	67.00	12.75	1.65
Threshed milo, ground	11.94	2.88	2.29	68.83	12.24	1.82
Corn, ground	9.69	4.59	2.72	70.66	10.96	1.38
Threshed kafir, ground	11.01	3.64	2.82	69.44	11.31	1.87
Cottonseed meal	43.38	8.38	9.04	24.96	8.25	5.99
Alfalfa hay grown in New Mexico	15.23	1.43	27.37	37.92	10.02	8.03
Alfalfa hay grown at Spur	16.30	1.57	27.98	35.07	9.41	9.67

It was deemed advisable to utilize Kansas corn for the particular lot of lambs which was to receive that concentrate since the investigators were desirous of feeding a grade of corn that would assure a fair and impartial test. Yellow corn was ordered, but unfortunately the white corn had to be utilized since the former kind was not available at the time the test was started. The milo that was utilized during this test represented a No. 1 grade and for the most part was grown on Substation No. 7, the balance, which was also of the same grade, was produced on an adjoining farm. The feterita that was fed was produced on the Station and was of excellent quality, representing a No. 1 grade. The kafir utilized was purchased at a point on the plains some thirty miles from the Station, and, although slightly inferior to the milo and feterita above referred to, it was easily classified under the No. 1 grade.

COST OF FEEDS.

The following prices for the feeds utilized during the experiment herein reported are considered fair and equitable, in so far as it has been possible to determine them:

Ground milo heads, per ton.....$30.00
Ground threshed feterita, per ton..... 41.77
Corn chops, per ton..... 63.09
Ground threshed milo, per ton..... 41.77

Ground feterita heads, per ton.....$30.00
Ground threshed kafir, per ton..... 41.77
Cottonseed meal, per ton..... 78.00
Alfalfa hay, per ton..... 30.00

The value assigned to the corn crops used during this test conforms with the wholesale price on a large shipment of corn into Texas in September, 1919, and is considered as being a fair figure upon which to base calculations. The actual price paid by the Station for the small amount of corn utilized during this test was $77.00 per ton. In the making of calculations, however, the figures are based on the wholesale figure of $63.09 per ton.

During the early fall months, milo, feterita, and kafir heads were available in the Plains country at a figure averaging around $25.00, although many tons of milo and feterita heads were disposed of at cheaper figures. Some choice milo heads were purchased for this test at $14.00 per ton. In the calculations, however, all figures are based on a price of $30.00 per ton for ground heads.

In calculating the values of the threshed ground grain sorghums utilized in this test, it was estimated that the milo, feterita, and kafir heads would thresh out seventy-five (75) per cent. grain. Assessing a charge of $4.45 per ton for threshing and $4.00 per ton for grinding, the ground threshed sorghums were valued at $41.77 per ton.

WEATHER CONDITIONS.

Table 2.—Showing maximum and minimum temperatures and precipitation at Substation No. 7 during period of feeding test.

Year.	Month.	Maximum temperature, degrees F.	Minimum temperature, degrees F.	Precipitation, inches.
1919	November*	62	16	0.8
1919	December	63	9	trace
1920	January	74	18	1.31
1920	February	80	18	trace

*After November 26, beginning of experiment.

All the lambs included in this test had access to shelter; therefore, the feeding experiment was not affected by inclement weather. Fortunately there was no precipitation on the regular weighing dates and the weighing was done according to schedule throughout the test. During the extremely cold weather the lambs did not consume a normal amount of water, but they remained on feed throughout the test and in not a single instance did a lamb get "off feed" throughout the entire test.

FEED LOTS AND WATER SUPPLY.

The six pens which were utilized during this test were of southern exposure and of similar size and structure. Each lot was provided with ample shelter, thus protecting the lambs from inclement weather. All feed racks were of the same size and of similar structure. Each lot

was given access to water three times daily: viz., in the forenoon after feeding, during the middle portion of the afternoon, and after the evening meal had been cleaned up, just before dark. The water consumed was supplied from a shallow well and is what is commonly designated as "gyp water" in that particular section of the Panhandle. Salt was accessible to each of the respective lots at all times throughout the entire test.

WEIGHT RECORDS.

Each of the respective lots was weighed on three consecutive days at the beginning and end of the experiment, the averages of the three weighings of the respective periods being considered the respective initial and final weights. Each lot was weighed at regular fifteen-day intervals throughout the test.

MANAGEMENT PRIOR TO TEST.

During the week preceding the inception of the feeding test the lambs had access to good pasture grass and were all fed together on a concentrated mixture of equal parts of ground corn, ground threshed feterita, ground threshed milo, and cottonseed meal. Since these lambs were not accustomed to grain, they were supplied with an initial feed of only ten pounds for the 120 head, but during the course of the week the concentrates were increased to forty-eight pounds daily to the entire number.

THE EXPERIMENT.

The lambs were divided into six lots of twenty head each, and the test proper was begun November 26, 1919. The concentrated ration at the outset consisted of seven parts by weight of grain to three parts of choice cottonseed meal. The alfalfa hay consumed during this test was of a No. 1 grade, a portion of it having been grown on Substation No. 7, and the balance being purchased in New Mexico.

The lambs were fed regularly at 7:00 a. m. and 5:00 p. m. daily. The rations for each of the respective lots were weighed in advance of the regular feeding periods in order to avoid any unnecessary delay in distributing the feed to each lot promptly at the regular assigned period. Combination hay and grain racks were utilized in each of the lots; therefore, it was necessary to remove the unconsumed hay from the feed racks twice daily. An accurate record of the hay weighed back from each lot was kept, as follows:

Lot I	323.50 pounds
Lot II	306.50 pounds
Lot III	328.25 pounds
Lot IV	306.00 pounds
Lot V	306.75 pounds
Lot VI	362.50 pounds

This rejected hay was supplied to the breeding flock; therefore, it could not be considered as being waste.

Table 3.—Summary of ninety-day feeding test.

	Lot I. Ground Milo Heads, Cottonseed Meal, Alfalfa Hay.	Lot II. Ground Threshed Feterita, Cottonseed Meal, Alfalfa Hay.	Lot III. Ground Corn, Cottonseed Meal, Alfalfa Hay.	Lot IV. Ground Threshed Milo, Cottonseed Meal, Alfalfa Hay.	Lot V. Ground Feterita Heads, Cottonseed Meal, Alfalfa Hay.	Lot VI. Ground Threshed Kaffir, Cottonseed Meal, Alfalfa Hay.
Number of lambs per lot	20	20	20	20	20	20
Average initial weight, lbs.	59.33	59.00	59.88	59.73	59.96	58.63
Average final weight, lbs.	91.91	91.42	95.25	95.16	90.46	92.13
Average total gain, lbs.	32.58	32.42	35.37	35.43	30.50	33.50
Average daily gain, lbs.	0.362	0.36	0.393	0.394	0.339	0.372
Average daily ration:						
1. Grain, lbs.	1.08	1.08	1.08	1.08	1.08	1.08
2. Cottonseed meal, lbs.	0.14	0.14	0.14	0.14	0.14	0.14
3. Alfalfa hay, lbs.	1.89	1.89	1.89	1.89	1.89	1.89
Total feed consumed per lamb:						
1. Grain, lbs.	97.211	97.211	97.211	97.211	97.211	97.211
2. Cottonseed meal, lbs.	12.588	12.588	12.588	12.588	12.588	12.588
3. Alfalfa hay, lbs.	170.4	170.4	170.4	170.4	170.4	170.4
Concentrates per 100 lbs gain, lbs.	337.01	338.66	310.43	309.89	359.99	327.75
Hay per 100 lbs gain, lbs.	523.02	525.60	481.76	480.94	558.68	508.65
Cost of feed per 100 lbs. gain	$ 13.828	$ 15.66	$ 17.284	$ 14.329	$ 14.771	$ 15.155
Average feed cost per lamb	4.50	5.08	6.11	5.08	4.50	5.08
Initial cost per lamb at feed lot at 13½ cents per pound	8.01	7.97	8.08	8.06	8.09	7.92
Interest, labor, shipping and selling charges per head, estimated	1.20	1.20	1.20	1.20	1.20	1.20
Total cost per lamb	13.71	14.25	15.39	14.34	13.79	14.20
Estimated selling weight at Fort Worth, lbs.	84.56	84.11	87.63	87.55	83.22	84.76
Selling price per lamb at Fort Worth at $19.50 per cwt.	$ 16.49	$ 16.40	$ 17.09	$ 17.07	$ 16.23	$ 16.53
Estimated net profit per lamb	2.78	2.15	1.70	2.73	2.44	2.33
Necessary selling price per cwt. to break even	16.21	16.94	17.56	16.38	16.57	16.75

By referring to Table 3, which is a summary of the feeding test, one will observe that the lambs in each of the respective lots received the same amount of concentrates and alfalfa hay. The investigators realized that Lots 1 and 5, which were fattened on ground heads, cottonseed meal, and alfalfa hay, received a larger amount of roughage and a smaller percentage of grain than did Lots 2, 3, 4, and 6. This method of feeding was considered as essential, however, since one of the main objects of the test was to determine the feeding values of ground heads as compared with the ground threshed grains on a pound for pound basis.

At the beginning of the test the lambs were supplied with one-half pound of concentrates and approximately one pound of alfalfa hay per head daily. The concentrates and roughage were increased gradually as the lambs' appetites warranted it. At the end of the fourth week the lambs were consuming 1.1 pounds concentrates and 2.2 pounds alfalfa hay per head daily.

After the lambs had been on feed four weeks the concentrated portion of the ration was changed from seven parts grain and three parts cottonseed meal to nine parts of grain and one part of cottonseed meal. The concentrates were increased gradually throughout the test until during the final period the lambs were receiving 1.6 pounds per head daily. As the concentrated portion of the ration was increased it became necessary to decrease the amount of roughage from a maximum of 2.2 pounds to 1.6 pounds per head daily.

Table 4.—Showing average weights (lbs.) of the lambs at the regular weighing periods throughout the ninety-day test.

Weighing periods.	Lot 1	Lot 2	Lot 3	Lot 4	Lot 5	Lot 6	Average weights
*Initial weight Nov. 26...	59.33	59.00	59.88	59.73	59.96	58.63	59.42
Dec. 11.....	66.00	61.00	66.50	68.00	66.50	64.75	65.45
Dec. 26.....	73.50	72.50	73.00	75.20	72.00	70.90	72.85
Jan. 10.....	76.10	76.40	77.95	80.50	75.60	74.80	76.89
Jan. 25.....	83.20	81.30	83.50	84.10	80.50	80.10	82.11
Feb. 9.....	85.90	85.00	87.80	87.50	86.00	82.10	85.71
*Final weight Feb. 24....	91.91	91.42	95.25	95.16	90.46	92.13	92.72
Gain per lamb.....	32.58	32.42	35.37	35.43	30.50	33.50	.....

*Average three weighings.

From a cursory examination of Table 4, it will be observed that the average gains made by the individual lambs in the respective lots were fairly consistent throughout the test. The uniformity of gains in Lots 3 and 4 in which ground corn and ground threshed milo were compared, are interesting, especially in view of the fact that there was a difference of $21.32 per ton in the purchase price of these two concentrates.

The lambs in Lot 4 required less feed per hundred pounds of gain than did any of the other lots. The difference in this respect, however, between Lots 3 and 4 was negligible, as can be observed by referring to Table 3. In this test the cost of feed per one hundred pounds of gain varied from $13.83 on Lot 1 receiving ground milo heads, cottonseed meal, and alfalfa hay to $17.28 on Lot 3 receiving corn chops, cottonseed meal, and alfalfa hay.

The average daily gains made by the lambs in the respective lots were all considered as being good. In fact, all gains were above the average expected in extensive feeding operations. The smallest average gain was made by the lambs in Lot 5, fattened on ground feterita heads, cottonseed meal, and alfalfa hay, at a cost of $14.77 per one hundred pounds of gain in live-weight, while the largest average gain was made by the lambs in Lot 4, at a cost of $14.33 per one hundred pounds of gain. In the test herein reported ground milo heads proved to be the most economical grain. In corroboration of the foregoing statement, a representative of Swift & Company recently informed the senior author that in their sheep feeding operations during the 1919-20 season a grain ration consisting of ground milo and feterita heads properly supplemented proved to be the most economical form of feeding these grains to fattening sheep and lambs.

It will be observed by referring to Table 3 that the interest, labor, shipping, and selling charges per head were estimated at $1.20,—a figure which appears rather high. This figure, however, has been arrived at as follows:

Shipping charges per head, Spur-Fort Worth (basis single deck 100 head)	$0.46
Selling commission per head	.12
Yardage charge per head	.05
Labor in feeding ninety days (estimated)	.50
Interest	.07
	$1.20

A valuation was placed on each of the six lots of lambs at the feed lots at the termination of the experiment by Mr. H. J. Butz, one of Swift & Company's sheep buyers from their Fort Worth plant. This expert handled the lambs in the respective lots very carefully and stated that each lot would have topped the Fort Worth lamb market on that date at $19.50 per hundred pounds. When asked to designate the lot carrying the most uniform finish, Swift's representative designated Lot 2, which had been fattened on ground threshed feterita, cottonseed meal, and alfalfa hay, as being the most uniformly fleshed, although he stated that each of the lots carried almost an equal degree of finish.

Reference to Table 3 will reveal that Lot 2 made second to the smallest daily gain during the ninety-day test. It is an interesting fact to know, however, that this particular lot carried the most uniform finish.

That lambs can be properly fattened on a basal ration consisting of any of the grain sorghums substituted for corn has been clearly demonstrated by this test. While the test herein reported can hardly be considered as being final and altogether conclusive, it does throw some valuable light upon the subject of feeding the grain sorghums to fattening lambs. Further study of these feeds is contemplated during the feeding season of 1920-21.

Owing to the fact that there is yet no standardized market for the grain sorghums in the areas where this crop is produced, it would be far more remunerative to the farmers producing these crops to market them via the livestock route.

In the test herein reported, the profits on the lots receiving the grain sorghums were actually larger than shown. The best grade of milo available anywhere was purchased locally at the rate of $14.00 per ton in the head, although in summarizing the results of this test all prices were based on what was considered actual market values. All the grain sorghums were valued at $25.00 in the head with an extra $5.00 added for grinding, this being the actual charge made for grinding heads in that section of the country during the past winter.

In this ninety-day test the lambs fattened on ground threshed milo made practically the same total gain as those fed on corn, the average gain per lamb receiving ground threshed milo being 35.43 pounds, while that of the corn fed lot was 35.37 pounds.

PRODUCTIVE VALUES OF FEEDS UTILIZED IN TEST.

The productive values of the feedstuffs utilized in this lamb feeding experiment have been calculated by Dr. G. S. Fraps, Chief, Division of Chemistry of this Station, from the results of this feeding test as shown in Tables 5 and 6. These productive values, calculated from chemical analyses of the several kinds of grains fed, are also given in Table 6, as are the average daily gains made by the respective lots of lambs.

According to Fraps, productive value, stated in terms of fat, is the most advanced method of measuring the value of a feedstuff. This author is quoted from Texas Agricultural Experiment Station Bulletin No. 170, entitled "Texas Feeding Stuffs; Their Composition and Utilization," pp. 10 and 11, as follows:

"The value of feed, for building or repair of flesh, is measured by means of its content of digestible protein.

"The value of feed for heat, bodily movements, or energy, or for productive purposes, is not so easily measured. The best measure that we have at present is the quantity of fat that it will produce upon a fattening animal. This we call the productive value of the food, or its fat-producing value, and it indicates not only the quantity of a fat that the food may be able to produce, but the relative value of the food for other purposes, such as for work, for energy, for uses of the animal body, etc.

"The productive value of a food is experimentally ascertained by first feeding an animal a ration which should produce a little fat and estimating exactly how much fat is produced from this ration. Then to this ration the food to be tested is added, and the quantity of fat produced is again estimated exactly. This cannot be done by weighing the animal, as such a method is too crude for exact work. The difference between the first quantity of fat produced and the second quantity of fat produced, shows how much fat the food is capable of producing, when it is fed to an animal that is already receiving enough food to take care of its bodily needs. It is then a simple matter to calculate the fat-producing value or productive value of the feed tested.

"The productive value, stated in terms of fat, is the most advanced method of measuring the value of a feed stuff. In the calculation of rations for animals, it was formerly assumed that the digestible nutrients of one food are equally as good as the digestible nutrients of any other food. As a matter of fact, that is not true. Different feeds vary considerably in the value of the digested nutrients contained in them, due to differences in losses and the work involved in chewing and digestion. The use of the productive value is a decided step forward in the calculation of rations for feeding animals."

Table 5 contains the calculation of the gain produced by one pound productive value in corn, and shows how the calculation is made, the productive value of each feed being calculated from the analyses given in Table 1, by the method described in Bulletin 185. The ration fed had a productive value of .408 pounds fat per day and per head. When the estimated productive value required for maintenance, calculated for the average live weight, is subtracted, 0.255 pounds productive value is left for the production of gain in weight. This produced 0.393 pounds gain in weight, so that one pound productive value fed in excess of maintenance, made 1.37 pounds gain in the sheep.

Table 5.—Calculation of gain produced by one pound productive value in corn.

Average feed supplied per head daily.	Productive value in terms of fat.	Pounds.
Corn, 1.08 lbs. (calculated productive value 0.203)	0.219	
Cottonseed meal, 0.14 lbs. (calculated productive value 0.179)	0.025	
Alfalfa hay, 1.89 lbs. (calculated productive value 0.087)	0.164	
Total fed, productive values of	0.408	
Used for maintenance (average 80 lbs. liveweight)	0.123	
Used for production	0.285	
Daily gain in weight (corn fed lot)		0.393
Gain for one pound productive value used for production in corn		1.37

Table 6.—Productive values calculated from feeding test.

	Lot I. Ground Milo Heads.	Lot II. Ground Threshed Feterita.	Lot III. Ground Corn.	Lot IV. Ground Threshed Milo.	Lot V. Ground Feterita Heads.	Lot VI. Ground Threshed Kafir.
Average daily gain in weight	0.360	0.360	0.393	0.394	0.339	0.372
Productive values required in form of corn to produce gain in weight	0.263	0.263	0.287	0.288	0.247	0.272
Productive values used for maintenance daily	0.120	0.120	0.123	0.123	0.120	0.120
Total productive value in feed	0.383	0.383	0.410	0.411	0.367	0.392
Productive value in cottonseed meal fed	0.025	0.025	0.025	0.025	0.025	0.025
Productive value in 1.89 lbs. alfalfa hay fed	0.164	0.164	0.164	0.164	0.164	0.164
Productive value in 1.08 lbs. grain fed	0.194	0.194	0.221	0.222	0.178	0.203
Productive value of 100 lbs grain fed	18.000	18.000	20.500	20.600	16.500	18.800
Calculated productive values	16.300	20.600	20.300	18.500	16.000	14.400

Table 6 contains the productive values calculated from the feeding test. From the average daily gain in weight, the productive value required to produce it is calculated, assuming that 1.37 pounds gain in weight is produced by one pound productive value. To this is added the maintenance requirement, based on the average weight, and the total gives the productive value required for maintenance and gain in weight. From this is subtracted the productive value of the alfalfa and cottonseed meal, and the balance is the productive value of the grain fed. The productive value of 100 pounds grain is then calculated from this. The productive values secured from the feeding test, are compared with the productive values calculated from the analyses given in Table 1.

After a careful analysis of the productive values actually obtained in this test, it will be observed that there was a wonderful consistency in these values throughout. Ground corn was taken as the standard, with a productive value of 20.5; ground threshed milo had a productive value of 20.6 in this test as compared with a calculated productive value of 18.5; ground milo heads had a productive value of 18 or 2.6 less than that of the ground threshed milo. Ground threshed feterita had a productive value of 18, while the feterita heads had a value of only 16.5. Ground threshed kafir in this test had a productive value of 18.8 as compared with a calculated value of 14.4. The productive values calculated from this test are, so far as the authors are aware, the first that have been calculated and published as a result of an extensive feeding test.

SUMMARY.

1. Lot 4, fattened on ground threshed milo, cottonseed meal, and alfalfa hay made a slightly larger but a much more economical gain than Lot 3, receiving corn, cottonseed meal, and alfalfa hay. The net profit per head in Lot 4 was $2.73, while that of Lot 3 was only $1.70.

2. Lot 1, fattened on a ration consisting of ground milo heads,

cottonseed meal, and alfalfa hay made the most economical gain of any of the lots.

3. The lambs receiving the ration consisting of ground milo heads, cottonseed meal, and alfalfa hay made a smaller gain than those receiving ground threshed milo, cottonseed meal, and alfalfa hay. The ground milo heads, cottonseed meal, and alfalfa hay, however, proved to be more economical than the ration consisting of ground threshed milo, cottonseed meal, and alfalfa hay.

4. In this test Lot 1, receiving ground milo heads, made a slightly larger and a much more economical gain than Lot 5 fed ground threshed feterita.

5. This test proved conclusively that corn shipped into Texas cannot successfully compete with the grain sorghums for fattening lambs in the semi-arid sections of Texas so well adapted to the production of these non-saccharine sorghums.

6. The results obtained in this test serve as a source of valuable information with reference to the feeding values of the grain sorghums. Further investigation is contemplated in the feeding of the grain sorghums at the Texas Station.